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Overview of Blood Pressure After Spinal Anesthesia with Preload and Without Preload 20cc Ringer Lactate in The Operating Room

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Dedi Irawan[1], Wilis Sukmaningtyas[1], Amin Susanto[1]

[1]Anesthesiology Nursing Study Program Applied Bachelor Program, Faculty of Health Harapan Bangsa University

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***Corresponding author:**
Dedi Irawan
Anesthesiology Nursing Study Program Undergraduate Program Faculty of Health Harapan Bangsa University, Indonesia Jl. Raden Patah No.100, Ledug, Kembaran, Purwokerto, Banyumas, Central Java, Indonesia.
Email: nsdediirawan@gmail.com

Abstract

Background: Spinal anesthesia is known to affect blood pressure by raising or lowering blood pressure levels, including MAP and pulse rate. While colloidal fluid therapy is indicated for the management of such variations, it remains longer in the intravascular space and supports blood pressure stabilization. **Purpose:** This study attempts to analyze the time and amount of Ringer Lactate fluid administration to stabilize blood pressure back to normal levels after spinal anesthesia. **Methods:** Quantitative research was adopted with an analytical, cross-sectional observation design. Data collection was facilitated using sheets for observing blood pressure and measuring blood pressure using a Tension meter. The study was performed over one month, from July to August, at Awal Bros Batam Hospital. A total of 40 respondents were taken for this study using total sampling. The data collected were analyzed using univariate analytical methods. **Results:** From the analysis, the mean average time taken for blood pressure changes after spinal anesthesia is 12.15 minutes standard deviation of 3.363. The time taken varied from a minimum of 5 minutes to a maximum of 20 minutes. As for the volume of Ringer Lactate fluid, on average, the volume given was 20 ccc/KGBB. Blood pressure change after spinal anesthesia had a mean of 99.65 standard deviations of 30.783, with the minimum measurement at 22 and the maximum at 167. **Conclusion:** This study shows the importance of giving Ringer Lactate fluid to stabilize blood pressure following spinal anesthesia, where both time and volume correlate positively with changes in blood pressure.

Keywords: blood pressure; colloidal solutions; ringer lactate; spinal anesthesia

Introduction

Broadly speaking, anesthesia is divided into two groups, namely general anesthesia and regional anesthesia. General anesthesia is a state of unconsciousness without reversible pain due to administration of drugs, as well as eliminating pain throughout the body centrally. The difference with regional anesthesia is anesthesia of a part of the body, a state of free pain without loss of consciousness [1]. Spinal anesthesia is indicated for inferior extremity surgery, pelvic surgery, surgery around the rectum-perineum, obstetric-gynecologic surgery, urologic surgery, lower abdominal surgery, and is increasingly used for inferior extremity orthopedic surgery [2].

Spinal anesthesia is easy and inexpensive to perform, but there are also many risks, including hypotension, high (spinal) block, radioculopathy, abscess, hematoma, arterivenous malformation, anterior spinal artery syndrome, hornes syndrome, back pain, dizziness, and neurological deficits [1]. One of the most frequent acute complications of spinal anesthesia is decreased blood pressure

(hypotension). The incidence of hypotension in spinal anesthesia is significant. In some studies, the incidence reaches 8 - 33%. Factors that affect the degree and incidence of hypotension in spinal anesthesia are the type of local anesthetic drug, the degree of sensory inhibition, age, gender, weight, physical condition of the patient, patient position, surgical manipulation [3].

The mechanism underlying the occurrence of hypotension in spinal anesthesia is mainly due to paralysis of sympathetic nerve preganglionic fibers that transmit motor impulses to peripheral vascular smooth muscle which will cause arteries and arterioles to dilate in areas that experience sympathetic denervation so that total peripheral vascular resistance occurs and average arterial blood pressure drops[4,5]. Furthermore, there will be dilatation of peripheral veins and venules with blood pooling and can reduce the return to the heart so that it can cause a decrease in cardiac output and blood pressure. Hypotension if it lasts long and is not treated will cause tissue and organ hypoxia [6]. Hypotension can be prevented by giving fluid preload right before anesthesia or with vasopressors [7].

A commonly used fluid preload is crystalloids such as lactated ginger. Because lactated ginger has a composition similar to extracellular fluid (CES = CEF), lactated ginger is effective as a resuscitation therapy with the administration of sufficient amounts will effectively overcome intravascular volume deficits[8–10]. The advantages of lactated ringers include low price, easily available in every health center, no need to cross match, no allergy or anaphylactic shock, simple storage and long shelf life [11] The half-life of lactated ringer's fluid in the intravascular space is about 20-30 minutes. In general, preload is carried out 15-20 minutes before the spinal anesthesia procedure is performed with the amount of lactated ringer given 10-15cc/kgbb [1].

In Awal Bros Botania Batam Hospital, patients who are not given preload before surgery tend to have decreased and unstable blood pressure, while in the hospital if the patient is given preload before the action is taken, the blood pressure tends to be stable, for this reason, the researcher will start the pre-survey on March 1, 2024 and will continue to sureve or data collection until the end of April 2024, for this data collection will be carried out in the recovery room or in the operating room recovery room.

Based on this background, it is necessary to conduct research to determine the difference in blood pressure after spinal anesthesia with the provision of crystalloid preload, especially lactated ringer with an amount of 20cc / kgbb and without giving preload. This is useful to take advantage of the use of crystalloids by increasing the amount of use and regulating the time of administration in spinal anesthesia.

Methods

The research method used a quantitative study with an analytical observational design, cross sectional. The instrument used for data collection uses a blood pressure observation sheet and a data measurement tool using a tension meter. This research was conducted for one month from July to August. The sample of this study amounted to 40 respondents using total sampling. The research location was at Awal Bros Hospital Batam. The University of California, Berkeley's Research Ethics Committee gave its stamp of approval to this study (B.L.PPM-UHB/846/08/2024).

Result

1. Respondent Characteristics

Table 1. Characteristics of Participants Based on Age, Gender

Characteristics	f	%
Age		

17-25	8	20.0
26-35	6	15.0
36-45	11	27.5
>56	15	37.5
Total	**40**	**100.0**
Gender		
Male	15	37.5
Female	25	62.5
Total	**40**	**100.0**

Based on table 4.1, the characteristics of participants are dominated by adult age> 56 years as many as 15 respondents (37.5%), age 17-25 years as many as 8 respondents (20.0%), age 26-35 years as many as 6 respondents (15.0%), and age 36-45 years as many as 11 respondents (27.5%) and female gender as many as 25 respondents (62.5%), male gender as many as 15 respondents (37.5%).

2. Distribution of Blood Pressure Before and After Spinal Anesthesia

Table 2. Distribution of blood pressure before and after spinal anesthesia

Blood Pressure	Before spinal anesthesia		After spinal anesthesia	
	f	%	f	%
Stable or normal if blood pressure change is less than 20%	28	70.0	17	42.5
Unstable if blood pressure change is more than 20%	12	30.0	23	57.5
Total	40	100	40	100

Based on table 4.2, the characteristics of blood pressure before spinal anesthesia were 28 respondents (70.0%) in the stable category and after spinal anesthesia as many as 23 respondents (42.5%) in the unstable category.

3. Distribution of preload administration in spinal anesthesia patients

Table 3. Frequency Distribution of Preload Administration in 20 Cc/KGBB Lactated Ringger Fluid Patients

Fluid administration	f	%
Preload 20 CC/KgBB	28	70.0
Without preload administration of 20 CC/KgBB	12	30.0
Total	40	100

Based on table 3 above, it can be seen that the number of respondents with the category of giving preload 20 CC / KGBB was 28 respondents (70.0%) and the category without giving preload 20 CC / KGBB was 12 respondents (30.0%).

Discussions

Respondent Characteristics

Based on table 1, respondent data based on participant characteristics were dominated by ages >56 years as many as 15 respondents (37.5%) and the least at the age of 26-35 years as many as 6 respondents (15.0%). This is in line with Pratiwi's research (2022), with the results of research on the age category of the majority of respondents at the age of> 56 years found as many as 24 (32.4%) respondents. This is in line with the research of Chaidir & Putri (2014), with the results of the study showing that patients who underwent spinal were mostly old adults as many as 33 people (84.6%). According to the researcher's assumption, the age above 56 years can be caused by several factors. One factor that affects changes in blood pressure is age. With age, the elasticity of blood vessels decreases, so blood pressure can decrease.

The decrease in blood pressure tends to be higher in older patients. This is due to the higher autonomic tone remaining after sympathetic denervation. Furthermore, another thing that causes old age to more often experience a decrease in blood during induction of spinal anesthesia is because there is a more active compensatory reflex, so the decrease in cardiac output will be adjusted with increasing age. Based on these data, it is in accordance with the results of this study that respondents with older age, namely over 45 years, are more

at risk of intraoperative hypotension caused by a decrease in body physiology (6).

Based on table 1, the characteristics of the participants were dominated by female gender as many as 25 respondents (62.5%) and male gender as many as 15 respondents (37.5%). This is in line with the research of Komang & Kristina (2022), with the results of research based on gender, most of the respondents were female, namely 27 people (69.2%). This is in line with the gender research in this study who experienced the most hypotension, namely women. This is in line with the research of Arsani et al. (2022), with the results of female gender research as many as 32 respondents (60.4%).

According to the researcher's assumption, women have higher levels of the hormone estrogen than men. Estrogen can affect blood pressure by reducing vascular resistance and increasing nitric oxide production, which can dilate blood vessels and lower blood pressure. Hypotension is one of the side effects that is often found in respondents after spinal anesthesia, the incidence of hypotension can be caused by several factors, one of which is gender [12,13]. Hypotension that is too long can cause tissue damage, and damage organs because patients experience hypoxia (7). This research is supported by Azizah et al. (2016) and Ansyori & Rihiantoro (2016) argue that hypotension that occurs in patients if not treated immediately will cause a decrease in consciousness and the patient will experience tissue hypoxia which causes tissue damage and if it lasts long it will cause shock and death (8).

Distribution of Blood Pressure before and after spinal anesthesia

Based on table 2, the characteristics of blood pressure before spinal anesthesia were 28 respondents in the stable category and after spinal anesthesia as many as 23 respondents in the unstable category. This is in line with Dewi's research (2021), with the results of the study that patients entered the operating room with a blood pressure of 115/55 mmHg in the stable category before spinal anesthesia was performed. However, after spinal anesthesia, the blood pressure value decreased to 90/46 mmHg in the unstable category. According to the researcher's assumption that patients who have not undergone spinal anesthesia have blood pressure that is still within normal limits, while patients who have undergone spinal anesthesia experience vasodilation which causes a decrease in blood pressure. Vasodilation is the widening of blood vessels, thus increasing the capacity of blood vessels and lowering blood pressure. This is caused by sympathetic blockade which causes the release of vasodilating neurotransmitters, such as acetylcholine and nitric oxide.

Distribution of Preload Administration in Patients

Based on table 3 above, it can be seen that the number of respondents in the category of giving preload 20 CC / KGBB was 28 respondents (70.0%) and the category without giving preload 20 CC / KGBB was 12 respondents (30.0%).

Based on table 4.3 above, it can be seen that the number of respondents in the category of giving preload 20 CC / KGBB was 28 respondents (70.0%) and the category without giving preload 20 CC / KGBB was 12 respondents (30.0%). Giving RL preload fluid will affect the volume of extracellular fluid which also plays a role in regulating blood pressure. The administration of RL preload fluid will affect the volume of extracellular fluid, but the body will provide compensatory measures to adjust blood pressure with the baroreceptor mechanism by changing cardiac output and total peripheral resistance through the effects of the

autonomic nervous system on the heart and blood vessels, as well as by moving fluid into the interstitium compartment or vice versa into the blood This fluid transfer occurs immediately and automatically due to changes in the balance of hydrostatic and osmotic forces acting on the capillary wall (9).

Crystalloid fluid is a fluid for initial resuscitation in patients. Crystalloid fluid when given in sufficient quantities (3-4 times colloidal fluid) is as effective as colloidal fluid administration to overcome intravascular volume deficits. The half-life of crystalloid fluids in the intravascular space is about 20-30 minutes. There are several crystalloid fluids available, the choice of fluid depends on the degree and type of loss. For water-only fluid loss, the replacement is hypotonic fluid and is also called a maintenance type solution. If the fluid loss is water and electrolytes, then replace it with isotonic fluid which is also called a replacement-type solution. Most types of perioperative fluid loss are isotonic, so the commonly used replacement type solution is Ringer Lactate (10).

Conclusion

The study conducted at Awal Bros Hospital Batam revealed that the majority of participants were older adults, predominantly female. Blood pressure stability was observed in most participants before spinal anesthesia, while a notable proportion experienced instability afterward. Additionally, a greater number of participants received a preload of fluid administration compared to those who did not.

Limitations Research

This study only examined patients who experienced changes in blood pressure after spinal anesthesia and the study sample was less than 100 respondents. This study is needed for accuracy in giving Preload 20 cc / kg / BW and is influenced by the physical and initial condition of the patient's blood pressure, fasting length and type of fluid that is adjusted by the patient's needs, including the patient's gender and age.

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Conflict of Interest Statement

The authors have confirmed that they have no competing interests.

Data Availability

The datasets used or generated in this study are available from the corresponding author upon reasonable request.

Author Contributions

Dedi Irawan: Conception and design of the study, Search Data Base, Methodology, Analysis Risk of Bias, Data Analysis and Interpretation, Writing, **Wilis Sukmaningtyas:** Study conception and design, search database, methodology, data analysis and interpretation, and writing, review, and editing. **Amin Susanto:** Conception and design of the study, Search Database, Methodology, Data Analysis and Interpretation, Writing, Review, and Editing.

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